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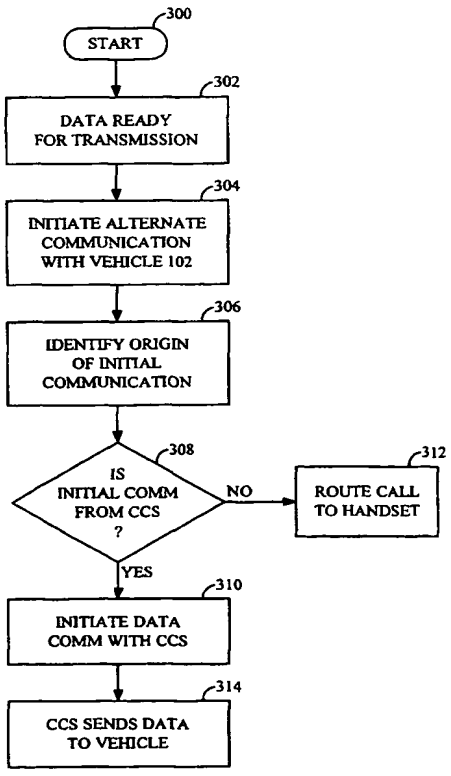

(57) Abstract: Method and apparatus for transmitting data from a central communication station (104) to a mobile communication device (106) using a pre-selected data protocol if the central communication station (104) cannot initiate data communication with the mobile communication device. The central communication station (104) contacts the mobile communication device (106) in a manner other than the pre-selected data protocol, such as by placing a wireless telephone call to the mobile communication device (106). The mobile communication device (106) contains means for determining the origin of the wireless telephone call (202, 200). If the mobile communication device (106) determines that the wireless telephone call originated from the central communication station (104), data communications are initiated by the mobile communication device (106) to the central communication station (104). Data is then transmitted from the central communication station (104) to the mobile communication device (106).

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METHOD AND APPARATUS FOR DATA TRANSMISSION TO A REMOTE COMMUNICATION DEVICE

BACKGROUND OF THE INVENTION

I. Field of the Invention

The present invention relates generally to wireless communication systems and more particularly to a method and apparatus for transmitting data from a central communication station to a remote communication device when the central communication station can not initiate data communications with the remote communication device.

II. Description of the Related Art

The use of wireless communication systems is well known for transmitting information between fixed stations and one or more geographically dispersed remote receivers. For example, satellite communication systems have been used in the trucking industry for many years to provide messaging and location information between fleet-owned dispatch centers and their respective tractor-trailer vehicles. Such systems offer significant benefits to fleet owners because they allow almost instantaneous communications and real-time position information. In addition, many such systems provide remote monitoring of the performance characteristics of each fleet-owned vehicle, such as the average speed, RPM, and idle time of each vehicle. An example of such a satellite communication system is disclosed in U.S. patent number 4,979,170 entitled "ALTERNATING SEQUENTIAL HALF DUPLEX COMMUNICATION SYSTEM AND METHOD", U.S. patent number 4,928,274 entitled "MULTIPLEXED ADDRESS CONTROL IN A TDM COMMUNICATION SYSTEM", and U.S. patent number 5,017,926 entitled "DUAL SATELLITE NAVIGATION SYSTEM", assigned to the assignee of the present invention and incorporated by reference herein.

In the satellite communication system described by the above-mentioned patents, fleet-owned dispatch centers communicate to their respective tractor-trailer vehicles using land-based systems such as telephone or fiber-optic networks to a central communication station (CCS), otherwise known as a network management facility (NMF), or hub. The CCS acts as a central communication station through which all communications between vehicles

and dispatch centers pass. The CCS comprises a number of network management computers (NMCs), each NMC responsible for providing a communication path from the CCS to geographically dispersed vehicles in the communication system using a geosynchronous satellite. The geosynchronous satellite comprises one or more transponders, which are electronic circuits well known in the art for relaying high frequency satellite communication signals between remote locations. Each NMC is assigned an individual transponder, each transponder operating at a unique frequency in order to avoid interference with communication signals on other transponders. In the satellite communication system of the above-referenced patents, each transponder is capable of handling the communications needs of approximately 30,000 vehicles.

Each vehicle in the communication system is equipped with a transceiver, otherwise known as a mobile communication terminal (MCT), for communicating message and location information to a pre-designated NMC via the geosynchronous satellite. The MCT typically also comprises an interface device which displays text messages to one or more vehicle occupants and accepts either voice or text messages to be transmitted to the vehicle's fleet-owned dispatch center. Furthermore, the MCT may further comprise a digital processor which communicates with one or more Electronic Control Units (ECUs) located at various points throughout the vehicle. Each ECU provides information relating to the operational performance of the vehicle to the digital computer indicating characteristics including, but not limited to, vehicle speed, engine RPM, and miles traveled.

The wireless communication system described above allows vehicle occupants to easily contact their respective dispatch centers in order to keep fleet personnel apprised of various events throughout a typical delivery cycle. For example, upon arrival at a predetermined pickup destination, a vehicle operator may contact a dispatch center associated with the vehicle to alert fleet personnel of the time and location of the arrival. Similarly, after the truck has been loaded at the pickup destination, the driver may send a message to the dispatch center indicating the time of departure, the location from where the departure occurred, and a description of the goods that is being transported. Another example where a vehicle operator might transmit a status message to the dispatch center is when an unscheduled stop has been made and/or when the vehicle departs from the unscheduled stop.

As stated above, mobile satellite communication systems have been used extensively in the past as the preferred method of communications. This was in

part due to the fact that satellite services offered ubiquitous coverage, even in remote areas of the world. However, with the increasing availability of alternative communication networks and services, such as cellular telephone networks, it has become feasible for communications to be transmitted through these alternative communication networks, instead of traditional satellite systems. The primary benefits of using a cellular telephone communication network rather than a satellite communication network are lower messaging costs and the availability of voice communications.

In order to transmit data, as opposed to voice, over a cellular telephone network, a pre-selected data protocol must be used by each mobile communication device and a central communication station. One of the more popular data protocols in use today is TCP/IP, which is used for data communications over the World Wide Web, including the Internet. TCP/IP is suitable for use as a wireless protocol as well.

TCP/IP (Transmission Control Protocol/Internet Protocol) is really two different data protocols which are used in conjunction with each other. Internet Protocol (IP) provides the basic delivery mechanism for packets of data sent between all systems on an internet, regardless of whether the systems are in the same room or on opposite sides of the world. IP does not guarantee to actually deliver the data to the destination, to guarantee that the data will be delivered undamaged, that data packets will be delivered to the destination in the order in which they were sent by the source, or that only one copy of the data will be delivered to the destination.

Because it makes so few guarantees, IP is a very simple protocol. This means that it can be implemented fairly easily and can run on systems that have modest processing power and small amounts of memory. It also means that IP demands only minimal functionality from the underlying medium (the physical network that carries packets on behalf of IP) and can be deployed on a wide variety of networking technologies.

Transmission Control Protocol (TCP) provides a reliable byte-stream transfer service between two endpoints on an intranet. TCP depends on IP to move packets around the network on its behalf. IP is inherently unreliable, so TCP protects against data loss, data corruption, packet reordering and data duplication by adding checksums and sequence numbers to transmitted data and, on the receiving side, sending back packets that acknowledge the receipt of data.

Before sending data across a data network, TCP establishes a connection with the destination via an exchange of management packets. The connection is destroyed, again via an exchange of management packets, when the application that was using TCP indicates that no more data will be transferred.

TCP has a multi-stage flow-control mechanism which continuously adjusts the sender's data rate in an attempt to achieve maximum data throughput while avoiding congestion and subsequent packet losses in the network. It also attempts to make the best use of network resources by packing as much data as possible into a single IP packet, although this behavior can be overridden by applications that demand immediate data transfer and don't care about the inefficiencies of small network packets.

In order to initiate communications using TCP/IP between a central communication station and a mobile data device, both entities must be assigned a unique IP address, or Internet Protocol address. The IP address is a four byte value that, by convention, is expressed by converting each byte into a decimal number (0 to 255) and separating the bytes with a period. An example of an IP address is 130.132.59.234.

IP addresses are sometimes permanently assigned to data devices and other times not. A device not having a permanent IP address must be assigned one every time communications are desired. Typically, such a remote data device, such as a home computer, contacts a primary data device (for instance, an Internet Service Provider or ISP) which assigns an IP address to the remote data device upon request. Once communications are terminated, the previously assigned IP address is no longer used by the remote data device and may be reassigned to a subsequent requesting device.

In a mobile application, IP addresses are typically not permanently assigned to mobile communication devices. The reason for this is due to the relatively infrequent need for a mobile device to communicate with a central communication station. When a mobile communication device wishes to communicate with a central station using TCP/IP, it must first request an IP address from a service provider. After an IP address has been assigned to the mobile communication device, data communications may take place between it and the central communication station.

One problem with mobile communication devices not having a permanent IP address is that a communication link can not be established by a central communication station wishing to establish communications with mobile communication devices. An IP address can not be assigned to the mobile communication device by a request from the central station to do so.

Therefore, there is a need in the mobile communications field to allow a central communication station to initiate data communications with one or more mobile communication devices.

SUMMARY OF THE INVENTION

The present invention is a method and apparatus for allowing a central communication station to initiate data communications with a remote communication device, when the central communication station would otherwise be unable to initiate data communications.

In accordance with one embodiment of the present invention, the remote communication device comprises a mobile communication device, located onboard a vehicle, for transmitting and receiving data with the central communication station. The mobile communication device comprises a transceiver section and a communication terminal. In the exemplary embodiment, the transceiver section comprises a cellular telephone capable of at least receiving communication signals from a central station over an existing cellular telephone network. The communication terminal comprises a processor, a display unit, an input device, and a memory for interfacing communications from the transceiver with one or more vehicle occupants. One or more electronic control units (ECUs), optionally located at various points throughout the vehicle, send and receive data to the communication terminal for display to the vehicle operator and/or to the transceiver for wireless transmission to the central communication station.

The transceiver comprises an apparatus for determining the origin of an incoming initial communication from the central station. In the exemplary embodiment, the initial communication is in the form of a wireless telephone call, and the apparatus for determining the origin of the incoming telephone call is commonly referred to as a "Caller ID" device.

In the exemplary embodiment, when data is available at the central communication station to be transmitted to a particular vehicle, the central communication station initiates a telephone call to the mobile communication device corresponding to the vehicle for which the data is available. When the telephone call is delivered to the intended mobile communication device, the Caller ID device determines the origin of the call. If the call is determined to have originated from the central communication station, this indicates that data is available to be transmitted to the mobile communication device from the central station, and the central station terminates the call. As a result of

receiving the telephone call from the central station, the mobile communication device initiates data communications with the central station.

BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects, and advantages of the present invention will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference characters identify correspondingly throughout and wherein:

FIG. 1 is an illustration of a wireless communication system in which the present invention is used;

FIG. 2 illustrates a transceiver and a communication terminal used in the communication system of FIG. 1; and

FIG. 3 is a flowchart detailing the steps that are performed to send data from a central communication station to a mobile communication device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a method and apparatus for enabling a central communication station to establish data communications with a remote communication device, when the central communication station would otherwise be unable to initiate data communications. The invention is described in the context of a vehicle-based mobile communication device in communication with a central communication station using a terrestrial-based, cellular telephone system. However, it should be understood that the present invention may be used in either wireless or tethered (non-wireless) applications. In relation to wireless applications, the present invention may be used with any number of wireless communication technologies such as TDMA, FDMA, or GSM terrestrial-based systems, or with satellite communication systems. Furthermore, the present invention may be used in a variety of vehicles, such as commercial trucks, busses, passenger vehicles, railcars, marine vessels, or airplanes. Finally, the present invention is not limited to use on or in vehicles, but can also be placed inside a package, worn as a personal monitoring device, or used in any situation for which it is desirable to initiate data communications from a central station to a remote data device.

FIG. 1 is an illustration of a wireless communication system in which the present invention is used. Information is communicated between host 100 and

ultimately vehicle **102** in the form of voice and/or data communication protocols. Host **100** communicates information to central communication station (CCS) **104** using well known communication channels, such as wireline or wireless telephone channels, fiber optic channels, or the like. Host **100** is typically a freight transportation company owning a large fleet of vehicles that are widely dispersed over a large geographic area. Typically, each vehicle comprises a mobile communication device **106**, enabling communications with host **100** by way of CCS **104**. Although only one host **100** and one vehicle **102** is shown in FIG. 1, in practice, many hosts **100** use CCS **104** to communicate information to and from their respective fleet vehicles.

The information sent by host **100** to CCS **104** may comprise voice or data information that is directed to one or more vehicles in the communication system. Information may also originate from CCS **104** independently of host **100**. In the case of information being transmitted from host **100**, CCS **104** receives the information and attempts to forward it to the identified vehicle or vehicles, as the case may be. The particular vehicle or vehicles for which the message is intended is identified by specifying an alpha-numeric code, typically a code corresponding to a serial number which has been pre-assigned to mobile communication device **106** installed on vehicle **102**. However, any known method may be used to uniquely identify vehicles in the communication system.

Voice information is routed to a Mobile Switch Controller (MSC) **108** through a public switched telephone network (PSTN) **110**. MSC **108** interfaces with one or more base station controllers, one of which is shown as base station controller BSC **112**. BSC **112** communicates with one or more base stations, one of which is shown as base station **114**. MSC **108**, BSC **112**, and base station **114** are all well known in the art for providing wireless communications between landline telephone users and wireless communication devices.

MSC **108** is a switch that accepts communications from PSTN **110** and routes them to the appropriate BSC **112**. Mobile communication devices, such as mobile communication device **106**, register periodically with one or more base stations. Registration is a well known technique in the mobile communication field that notifies MSC **108** where mobile communication devices are operating and through which base station or base stations they are in communication with. This allows for efficient routing of messages to the mobile communication devices.

Voice information is directed to a particular mobile communication device **106** using an identification code pre-assigned to each mobile

communication device **106**. The identification code is commonly known as a Mobile Identification Number (MIN), Electronic Serial Number (ESN) or a combination of the two. In the exemplary embodiment, MINs are used to uniquely identify mobile communication devices in the communication system.

Each MIN is unique to all other MINs distributed in the communication system. MSC **108** contains a database (not shown) which stores registration information for all mobile communication devices which are actively registered with MSC **108**. The information comprises a MIN and a corresponding base station or base stations **114** that a particular mobile communication device is currently registered. Voice calls received by MSC **108** each contain a MIN corresponding to the mobile communication device that the call is intended for. MSC **108** looks up the MIN for each call received and routes the call to the base station **114** that the intended mobile communication device is operating within. At base station **114**, the call is typically converted into a telephonic protocol suitable for wireless transmission to the mobile communication device, such as AMPS, CDMA, or GSM. In the exemplary embodiment, the telephonic protocols of Industry Standard IS-95, and its derivatives, are used.

Each voice call begins with an initial communication to the mobile communication device advising it that a call is available for reception. Typically, an audible alert is generated by the mobile communication device to alert a user that a call is available. The initial communication may also include a MIN corresponding to the location from which the call originates. This is useful for identifying the origin of a call, as will be discussed later herein.

The initial communication sent by base station **114** is received at mobile communication device **106** by transceiver **116**. Transceiver **116** contains electronic circuitry well known in the art for receiving, downconverting, and demodulating the received initial communication. The initial communication is then routed to communication terminal **118** which routes it to terminal **120**, typically a telephone handset.

By contrast, when data is transmitted from CCS **104** to vehicle **102**, it does not utilize the same communication protocol that is used to place a voice call, as explained above. Rather than transmitting data through PSTN **110**, CCS **104** sends data through computer network **122** using a pre-selected data protocol. In the exemplary embodiment, the pre-selected data protocol is TCP/IP, which is well known in the art as a suite of protocols used extensively for communications over computer network **122**. Computer network **122** is a system of many large computer networks joined together over high-speed backbone data links, ranging, for example, from 56 Kbps to T-1, T-3, OC-1 and

OC-3. Computer network **122** comprises frame relay network **124** and router **126**. Frame relay network **124** accepts a wide variety of data frames, each associated with a different data protocol, and transports them to one or more destinations. Router **126** is essentially an interface between MSC **108** and frame relay network **124**. In addition, router **126** performs additional duties, such as finding the best route between two networks, load balancing, and prioritization of data transmission, among others. Frame relay network **124** and router **126** ensure that data packets from CCS **104** are sent to MSC **108** and vice-versa.

TCP/IP typically combines two well known protocols: IP, or Internet Protocol, and TCP, which represents Transmission Control Protocol. IP provides the addressing needed to allow router **126** to forward data, generally broken down into small segments, or packets, across a multiple-computer network. IP attempts to deliver every data packet, but has no provisions for re-transmitting lost or damaged packets. IP leaves such error correction, if required, to higher level protocols, such as TCP.

IP requires an IP address of an intended recipient in order to work properly. IP addresses are 32 bits in length and have two parts: the Network Identifier (Net ID) and the Host Identifier (Host ID). Assigned by a central authority, the Net ID specifies the address, unique across the Internet, for each network or related group of networks. Assigned by a local network administrator, the Host ID specifies a particular host, station, or node within a given network and need only be unique within that network.

TCP provides end-to-end connectivity between a data source and a destination with detection of, and recovery from, lost, duplicated, or corrupted data packets – thus offering the error control lacking in lower level IP routing. In TCP, message blocks from applications are divided into smaller segments, each with a sequence number that indicates the order of the segment within the block. The destination device examines the message segments and, when a complete sequence of segments is received, sends an acknowledgement (ACK) to the source, containing the number of the next byte expected at the destination.

At MSC **108**, data packets are received by Interworking module (IWF) **128**. IWF **128** acts as an interface between MSC **108** and computer network **122** for transmitting and receiving data packets. Data packets received from IWF **128** are provided to BSC **112** and base station **114** much the same way that voice data is routed. However, instead of locating an MIN associated with an intended vehicle for which voice data is intended in a local database, MSC **108** locates an IP address associated with mobile communication device **106** for

which the data is intended. The data is then sent to the base station **114** under which vehicle **102** is currently registered with, where it is then transmitted to vehicle **102**, generally using wireless data protocols, such as those widely known and described in Industry Standards IS-99 and IS-707.

Vehicle **102** receives the data using transceiver **116**, which downconverts and demodulates the data, and then provides to communication terminal **118** for processing. Communication terminal **118** accepts input from input device **130**, outputs data to output device **132**, and both sends and receives data from electronic display unit (ECU) **134**. Input device **130** is typically a keyboard or voice actuated transducer for entering data to communication terminal **118** by a vehicle occupant. Output device **132** is typically a visual display device which presents data from communication terminal **118** to a vehicle occupant. Output device **132** could also be an audio transducer which presents audio data to the vehicle occupant. ECU **134** is an electronic device used on vehicle **102** to monitor a particular operating feature of vehicle **102**. For example, ECU **134** could be a speedometer, an odometer, an RPM meter, or any other transducer to provide pertinent operating data to communication terminal **118**. Typically, many ECUs **134** are installed into vehicle **102**, although only one is shown in FIG. **1**.

Electronic data received by transceiver **116** is provided to communication terminal **118**, where it is directed towards an intended device. For example, the data received by transceiver **116** could be a text message to a vehicle occupant and would be directed toward output device **132**. The data could also be a digital message directed to a particular ECU **134**, directing it to cease or begin operation.

The above discussion with respect to data transmission assumes that mobile communication device **106** is currently assigned a valid IP address at the time data is to be delivered to it from CCS **104**. However, mobile communication device **106** generally is not assigned a permanent IP address. This is because of the way in which an IP address is assigned to mobile communication device **106**.

IWF **128** is responsible for assigning an IP address to mobile communication device **106** upon request from the mobile communication device **106**. IWF **128** assigns IP addresses using well-known techniques in the art. For example, the first two numbers of the IP address are generally the Net ID permanently assigned to the particular IWF **128** through which vehicle **102** desires communications through. When an IP address is requested, IWF **128** randomly assigns a 4 digit IP address having its permanently assigned Net ID

as the first two numbers of the IP address. For example, if a first IWF **128** is assigned a Net ID of **127**.55, it will assign IP addresses having a format of 127.55.XXX.YYY, where XXX and YYY are each numbers ranging from 0 to **255**. A second IWF **128** having a Net ID of 45.188 will assign IP addresses having a format of 45.188.XXX.YYY.

As vehicle **102** travels throughout the communication system, communications are necessarily routed through different base stations **114**, MSCs **108**, and IWFs **128**. Whenever communications with vehicle **102** are directed through a new MSC **108**, and, hence, a new IWF **128**, an IP address associated with mobile communication device **106** will generally change. In order for CCS **104** to initiate data communications with mobile communication device **106**, it must have a valid IP address currently assigned. Because the location of vehicle **102** is generally not known at the time data is to be transmitted to it, the IP address associated with mobile communication device **106** assigned to vehicle **102** is generally not known either. Therefore, CCS **104** generally can not initiate a data communication to mobile communication device **106**.

The present invention overcomes this problem as follows. When CCS **104** receives data from host **100** intended for vehicle **102**, or when data is independently generated by CCS **104**, CCS **104** initiates contact with vehicle **102** in an alternate protocol than what is typically used to transmit data. CCS **104** initiates an indication to vehicle **102** that data is available for it at CCS **104**. In the exemplary embodiment, the alternate protocol in which communications are initiated is a telephonic communication protocol, by CCS **104** placing a wireless telephonic communication to mobile communication device **106**. However, the present invention is not limited to this method. Any other method of informing vehicle **102** that data is available at CCS **104** may be used. For example, CCS **104** could also contact a vehicle operator using a CB radio, LMR radio, or the like, and verbally request that the operator initiate data communications with CCS **104**. Alternatively, mobile communication device **106** may have the capability of receiving a satellite signal or an infrared signal, in which case CCS **104** could contact vehicle **102** using a satellite or infrared source, respectively.

Because each vehicle **102** is assigned a permanent MIN, telephonic communications can usually be placed to the vehicle, no matter which MSC or base station the vehicle is operating within. CCS **104** places a telephonic communication to the intended vehicle **102** through PSTN **110**, MSC **108**, BSC **112**, and base station **114** using standard telephonic protocols as described

above. As stated above, the process of placing a telephonic communication typically involves a telephonic communication device sending an initial communication to a destination device indicating that a telephonic communication is pending for the destination device. In the field of wireless communications, this initial communication is typically sent over a paging channel in a message containing an origination code, typically a MIN, assigned to the telephonic communication device sending the initial communication. By sending the MIN associated with the telephonic communication device, a destination device can determine the origin of a call using well known techniques in the art, generally know as Caller ID.

FIG. **2** illustrates a more detailed view of transceiver **116** and communication terminal **118**. The initial communication is received by vehicle **102** using transceiver **116**. Transceiver **116** contains the necessary hardware for determining the origin of the initial communication by examining the origination code, or MIN in the exemplary embodiment, contained within the initial communication, and is shown as caller ID **200**. Caller ID **200** uses well-known methods to determine the origin of the received initial communicaiton, as explained above. Typically, caller ID **200** displays a telephone number associated with the MIN for viewing by a communication device operator, in this case, a vehicle occupant, to help the operator determine whether or not to accept a call. In the present system, the phone number associated with each initial communication received is displayed on either output device **132** or handset **120**, except if the initial communication originates from CCS **104**, as explained below.

In the present invention, processor **202** receives the initial communication from RF device **204**, which is responsible for downconverting and demodulating the initial communication. Caller ID **200** then determines the MIN from the initial communication and provides a telephone number associated with the MIN to processor **202**, although the MIN itself could alternatively be provided either alone, or together with, the telephone number. In addition, although caller ID **200** is shown in FIG. **2** as a separate entity from processor **202**, it should be understood that caller ID could alternatively be incorporated into processor **202** using techniques well-known in the art.

Processor **202** then compares the telephone number provided by caller ID **200** to an identification code associated with a predetermined location, generally a telephone number associated with CCS **104**, which has been stored in memory **206**. In the preferred embodiment, the telephone number stored in memory **206** is the telephone number of CCS **104**, however, it could

alternatively be associated with some other predetermined location, such as host **100**. If the telephone number associated with the initial communication matches the telephone number stored in memory **206**, communication terminal is informed of the match, and a data communication is initiated with CCS **104**, as explained below. In addition, mobile communication device **106** does not answer the call if it has been determined that the call has originated from the location associated with the telephone number stored in memory **206**.

The initial communication is not answered by mobile communication device **106**, in the preferred embodiment. Instead, as soon as the initial communication is successfully received by transceiver **116**, an acknowledgement message is transmitted back to CCS **104**, alerting CCS **104** that the initial communication was successfully received by vehicle **102**. This acknowledgement protocol is a well known telecommunication protocol that is widely used in the telecommunication industry.

When CCS **104** receives the acknowledgement message that the initial communication was successfully received by mobile communication device **106**, it terminates the telephone call. Because CCS **104** knows that vehicle **102** has received the initial communication, and has therefore inherently communicated to vehicle **102** that it should initiate a data communication, there is no need for mobile communication device **116** to answer the telephone call.

Processor **208**, located in communication terminal **118**, receives an indication from processor **202** that it should initiate a data communication with CCS **104** in response to the initial communication from CCS **104**. Communication terminal **118** further comprises memory **210** for storing a second identification code associated with CCS **104**, host **100**, or any other entity that vehicle **102** is pre-programmed to initiate data communications upon receipt of an indication from processor **202**. In the exemplary embodiment, the second identification code is an IP address associated with CCS **104**. Processor **208** initiates an initial data communication with CCS **104** by sending a message in accordance with the previously-discussed TCP/IP protocol, including the IP address stored in memory **210** corresponding to the pre-determined entity. The initial data message is modulated and upconverted by transceiver **116** and transmitted to base station **114**, BSC **112**, and then to MSC **108**.

At MSC **108**, the initial data message from vehicle **102** is received, downconverted, and demodulated, then provided to IWF **128**. A further function of IWF **128** upon receiving an initial data message from vehicle **102** is to assign an IP address to the vehicle. For example, if the Host ID for IWF **128** is 124.45, then IWF **128** assigns an IP address to vehicle **102** by appending two

digits to the Host ID, such as 23.155 to arrive at an assigned IP address of 124.45.23.155. IWF **128** ensures that no other vehicle is presently assigned the same IP address.

Once IWF **128** has assigned an IP address to vehicle **102**, the initial data message is modified to include the newly assigned IP address associated with vehicle **102**. The modified initial data message is then sent to router **126**, frame relay network **124**, then on to CCS **104**, in accordance with the IP address associated with CCS **104**, as provided in the initial data message. The modified initial message is then received by CCS **104**. CCS **104** may now send data to vehicle **102** because vehicle **102** now possesses a valid IP address, as provided in the modified initial data message.

FIG. **3** illustrates a flow diagram of the method used to initiate data communications from CCS **104** to vehicle **102** if vehicle **102** does not have a presently assigned IP address.

The process begins at step **300**. In step **302**, CCS **104** desires to initiate a data communication with vehicle **102**, either because it has received a data communication from host **100**, or because CCS **104** has generated independent data that is to be transmitted to vehicle **102**. In either case, the data communication identifies a particular vehicle(s) **102** for which the communication is intended, generally by supplying an alpha-numeric code corresponding to a serial number which has been pre-assigned to mobile communication device **106** and installed on vehicle **102**. Each mobile communication device **106** is pre-assigned a permanent Mobile Identification Number or MIN that is typically stored in a database at CCS **104**.

In order to send the data communication from CCS **104** to the intended vehicle **102**, mobile communication device **116** must have a valid IP address assigned to it in order for CCS **104** to initiate a data communication with vehicle **102**. Generally, mobile communication device **106** only has a valid IP address when it is in active data communications through IWF **128**.

In step **304**, CCS **104** initiates contact with vehicle **102** using an alternate communication protocol than what is typically used to transmit the data communication. CCS **104** initiates an indication to vehicle **102** that data is available for it at CCS **104**. In the exemplary embodiment, the alternate communication protocol used to initiate communications is a telephonic protocol, by CCS **104** placing a telephone call to mobile communication device **106**. However, the present invention is not limited to this method.

CCS **104** accesses the database to determine the MIN corresponding to the alpha-numeric code and, hence, the vehicle **102** for which the data

communication message is intended. In the exemplary embodiment, CCS **104** places a telephone call to the intended vehicle **102** through PSTN **110**, MSC **108**, BSC **112**, and base station **114**, as described above. The process of placing a telephone call typically involves sending an initial communication to the receiving device indicating that a telephone call is pending for that device. The initial communication includes a MIN corresponding to CCS **104**.

In step **306**, the initial communication is routed to vehicle **102** and received by transceiver **116**. Transceiver **116** contains caller ID **200**, processor **202**, and memory **206** for determining the origin of the incoming initial communication by determining the MIN and/or telephone number included in the initial communication. In step **308**, if processor **202**, caller ID **200**, and memory **206** determine that the initial communication has originated from CCS **104**, or any other predetermined location, an indication of this event is sent to processor **208**, the indication alerting processor **208** that data is waiting to be retrieved from CCS **104**. The initial communication is then terminated by CCS **104**. Processing then continues to step **310**.

If processor **202**, caller ID **200**, and memory **206** determine that the origin of the initial communication is not CCS **104**, then that is an indication that the initial communication is a "typical" voice call intended for a vehicle occupant. In this case, in step **312**, the call is routed to handset **120** for use by the vehicle occupant.

In step **310**, processor **208** initiates a data communication with CCS **104** by sending an initial data communication using transceiver **116**. The initial data communication is sent in accordance with a pre-selected data protocol, in the exemplary embodiment, TCP/IP. The initial data communication is received by base station **114**, then sent to BSC **112** and then to IWF **128** contained within MSC **108**. IWF **128** assigns an IP address to mobile communication device **106** and appends the initial data communication with this information. The appended initial data communication is then forwarded ultimately to CCS **104**.

In step **314**, CCS **104** begins transmitting data to vehicle **102** in accordance with the pre-selected data protocol, using the IP address supplied by the appended initial data communication received from IWF **128**.

The previous description of the preferred embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without the use of the inventive faculty. Thus, the present invention is not intended to be limited to the embodiments shown herein but is

to be accorded the widest scope consistent with the principles and novel features disclosed herein.

5

What is claimed is:

CLAIMS

1. Apparatus for transmitting data from a central communication station to a mobile communication device using a pre-selected data protocol, comprising:

means for transmitting an initial communication to the mobile communication device in a manner other than the pre-selected data protocol;

means for receiving said initial communication by said mobile communication device;

means for identifying an origin of said initial communication by said mobile communication device;

means for comparing said origin to an identification code associated with a predetermined location; and

means for initiating a data communication by said mobile communication device to said predetermined location when said origin matches said identification code.

2. Apparatus of claim 1 wherein said initial communication comprises an origination code corresponding to said central communication station.

3. Apparatus of claim 1 wherein said means for transmitting said initial communication comprises a wireless telephonic communication device.

4. Apparatus of claim 1 wherein said means for identifying an origin comprises a caller ID device.

5. Apparatus of claim 1 wherein said means for comparing said origin to an identification code associated with a predetermined location comprises:

a memory for storing said identification code; and

a processor connected to said memory for determining an origination code corresponding to said origin of said initial communication and comparing said origination code to said identification code.

6. Apparatus of claim 5 wherein said origination code and said identification code is each a telephone number corresponding to said central communication station and said predetermined location, respectively.

7. Apparatus of claim 5 wherein said memory is further for storing a second identification code corresponding to said predetermined location.

8. Apparatus of claim 7 wherein said second identification code is an IP address.

9. Apparatus of claim 1 further comprising:

means for detecting when said initial communication has been successfully received by said mobile communication device; and

means for discontinuing further communication from said mobile communication using said manner other than said pre-selected data protocol if said initial communication was successfully received by said mobile communication device.

10. Method of transmitting data from a central communication station to a mobile communication terminal using a pre-selected data protocol, comprising the steps of:

transmitting an initial communication to the mobile communication terminal in a manner other than the pre-selected data protocol;

receiving said initial communication by said mobile communication terminal;

identifying an origin of said initial communication and comparing it to an identification code associated with a predetermined location;

initiating a data communication by said mobile communication device to said predetermined location if said origin matches said identification code.

11. Method of claim 10 wherein said initial communication comprises an origination code.

12. Method of claim 11 wherein said origination code comprises a telephone number corresponding to said central communication station.

13. Method of claim 10 further comprising the step of:

terminating said initial communication by said central communication station if said initial communication is successfully received by said mobile communication device.

14. Method of claim 10 wherein said pre-selected data protocol is TCP/IP and the step of transmitting said initial communication comprises the step of sending a wireless telephone call to said mobile communication device.

15. Method of step 10 wherein the step of identifying an origin of said initial communication comprises the steps of:

determining an origination code from said initial communication corresponding to said origin; and

comparing said origination code to said identification code.

16. Method of claim 15 wherein said origination code and said identification code each comprises a telephone number.

17. Apparatus for transmitting data from a central communication station to a mobile communication device using a first communication protocol, comprising:

a transceiver for receiving an initial communication of a second communication protocol, said origin comprising an origin of said initial communication;

a memory for storing an identification code associated with a predetermined location;

a processor connected to said transceiver and to said memory for identifying said origin of said initial communication, for comparing said origin to said identification code stored in said memory, and for initiating communications of said first communication protocol if said origin matches said identification code.

18. Apparatus of claim 17 wherein said first communication protocol comprises a data protocol and said second protocol comprises a telephonic protocol.

19. Apparatus of claim 17 wherein said predetermined location comprises an entity wishing to transmit data to said mobile communication terminal.

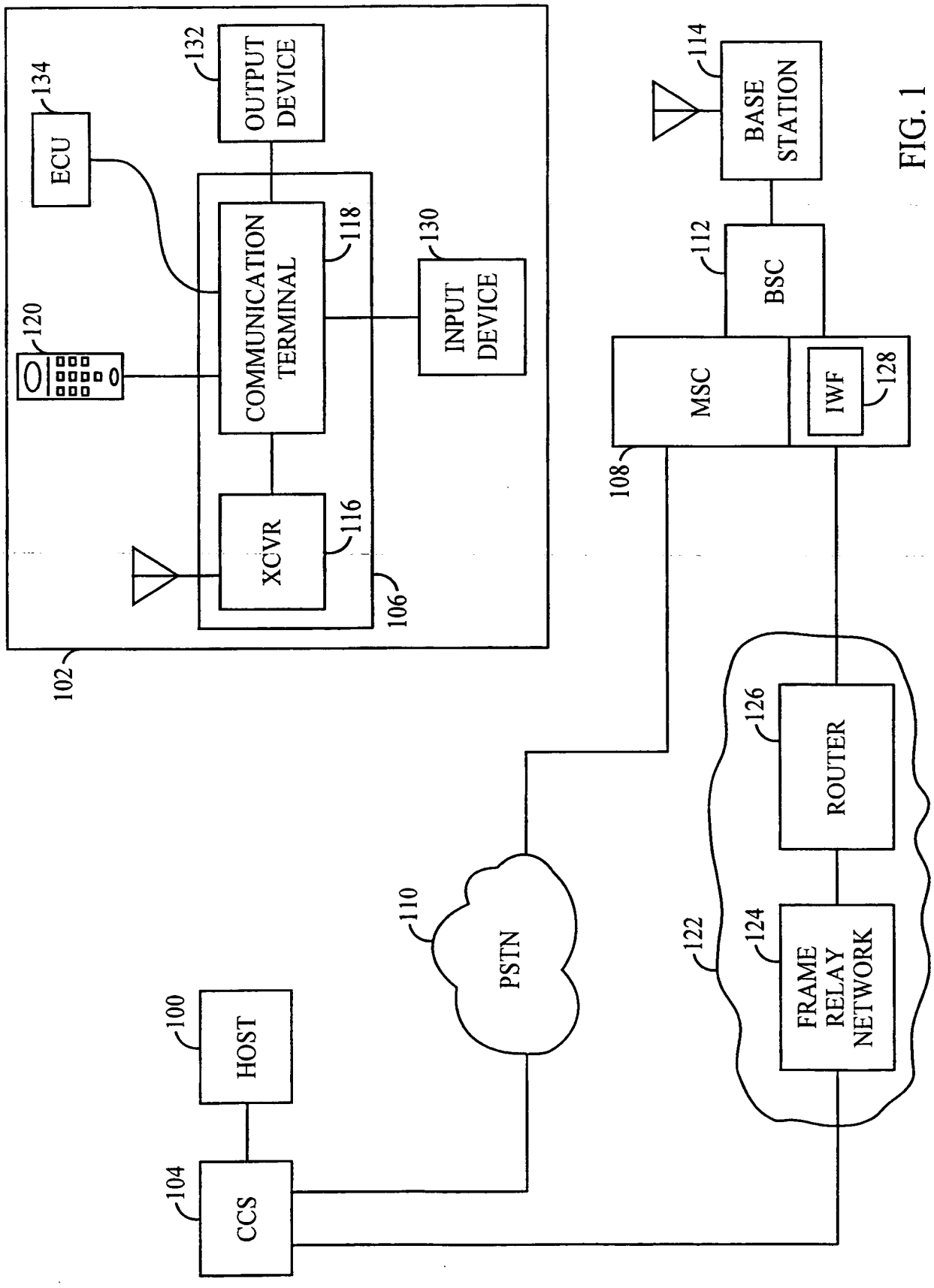

FIG. 1

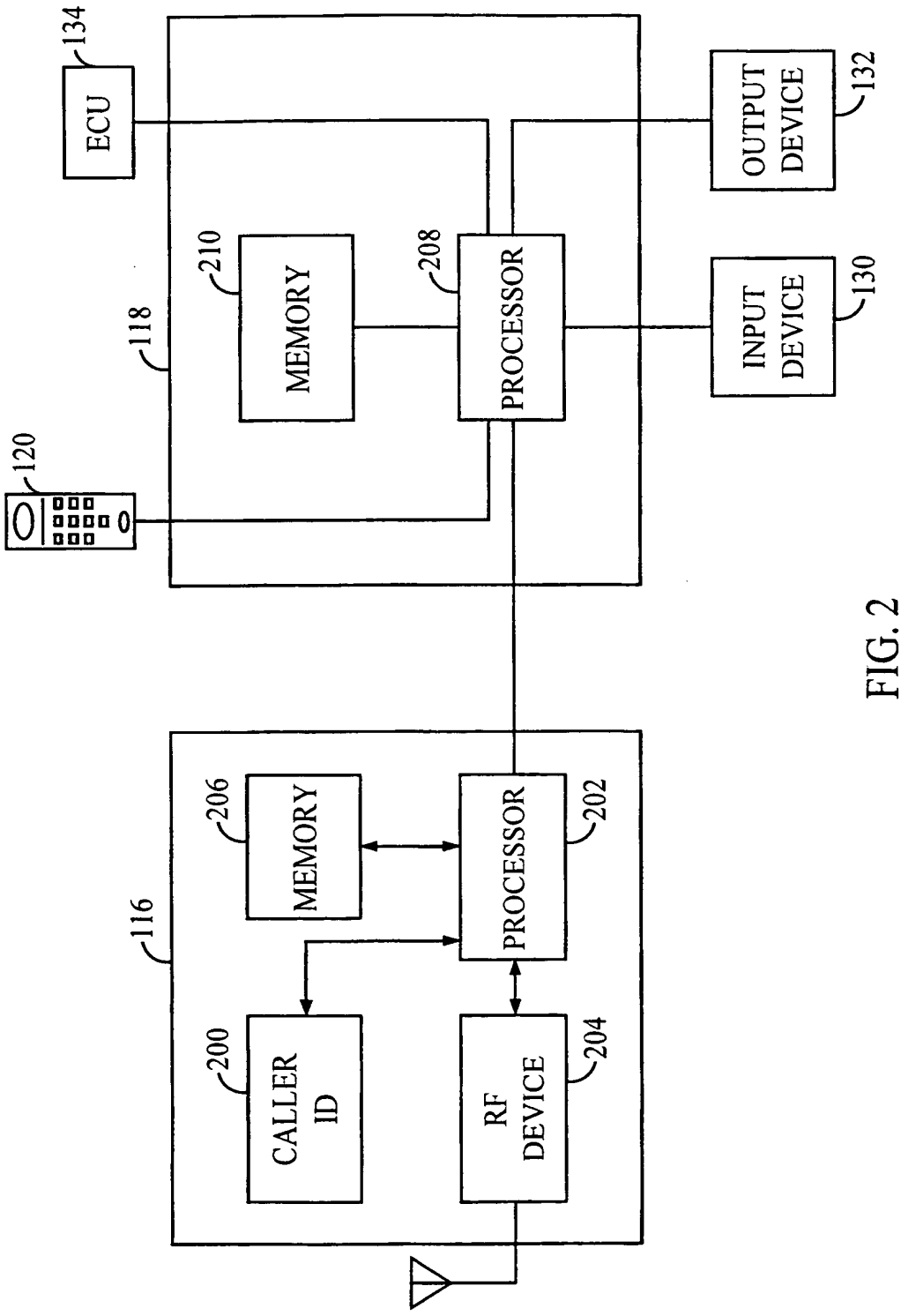
ECU
134
OUTPUT DEVICE
132
MEMORY
210
PROCESSOR
208
118
INPUT DEVICE
130
120
MEMORY
206
PROCESSOR
202
116
CALLER ID
200
RF DEVICE
204

FIG. 2

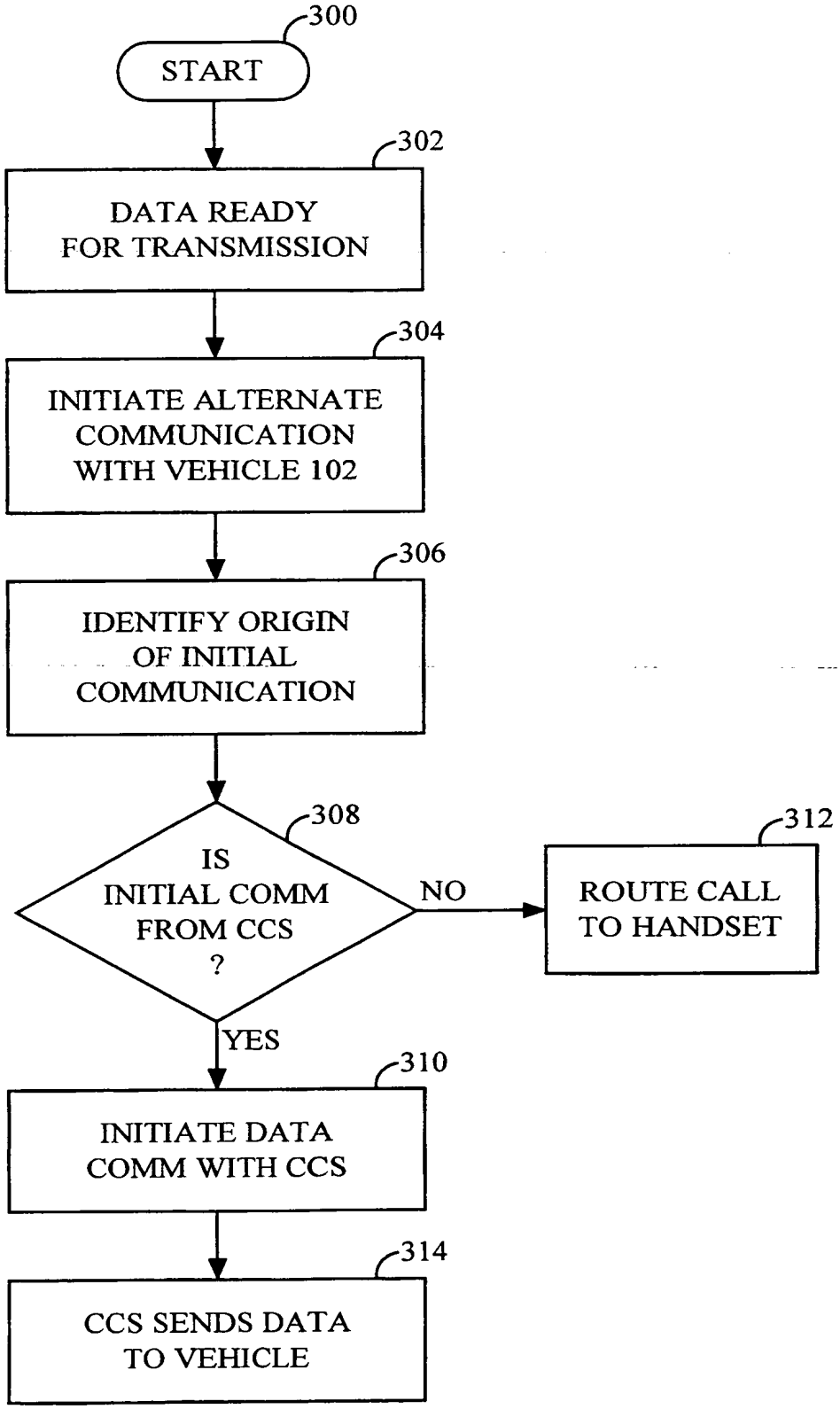

FIG. 3

INTERNATIONAL SEARCH REPORT

Inte 'onal Application No
PCT/US 00/14234

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/28 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04Q H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, INSPEC, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 869 688 A (NOKIA MOBILE PHONES LTD) 7 October 1998 (1998-10-07) column 2, line 18 - line 39 column 3, line 2 - line 8 column 3, line 44 - line 55 column 9, line 25 -column 13, line 36 ---	1-19
A	WO 99 01999 A (ERICSSON TELEFON AB L M) 14 January 1999 (1999-01-14) page 1, line 15 - line 29 page 3, line 5 - line 30 page 4, line 14 - line 15 page 5, line 1 -page 7, line 25 page 9, line 20 - line 28 --- -/--	1,10,17

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 September 2000	06/10/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Gerling, J.C.J.

1

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INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/US 00/14234

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99 09766 A (ERICSSON GE MOBILE INC) 25 February 1999 (1999-02-25) page 1, line 13 - line 26 page 2, line 28 -page 3, line 15	1,10,17
A	WO 99 12367 A (HIGHWAYMASTER COMM INC) 11 March 1999 (1999-03-11) page 3, line 3 - line 28 page 17, line 3 -page 18, line 12	1,10,17

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter nal Application No
PCT/US 00/14234

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WO 9901999 A	14-01-1999	AU 8251298 A	25-01-1999
		EP 0993743 A	19-04-2000
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		EP 1010341 A	21-06-2000